U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS
IN COOPERATION WITH THE SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

SOIL SURVEY OF McCOOK COUNTY SOUTH DAKOTA

BY

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[Advance Sheets—Field Operations of the Bureau of Soils, 1921]

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[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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SOIL SURVEY OF McCOOK COUNTY, SOUTH DAKOTA.

By W. I. WATKINS, in Charge, and C. E. DEARDORFF, of the United States Department of Agriculture, and J. A. MACHLIS and GLEN AVERY, of the South Dakota Agricultural Experiment Station.

DESCRIPTION OF THE AREA.

McCook County is situated in the southeastern part of South Dakota. The southeastern corner of the county is about 36 miles west of the point where Iowa and Minnesota join South Dakota. The county has a total area of 573 square miles, or 366,720 acres.

The average elevation of McCook County is about 1,400 feet above sea level. The topography varies from flat to strongly rolling, but the greater part of the county is level to undulating. The more level areas are confined to the central parts of the broad divides, which become more undulating as the streams are approached and drop rather abruptly to the stream bottoms.

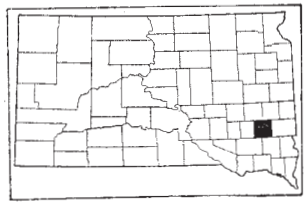

FIG. 18.—Sketch map showing location of the McCook County area, South Dakota.

The most extensive flat area is in the eastern part of Pearl Township, on the divide between West Fork Vermilion River and Wolf Creek. This area extends south almost to the Chicago, St. Paul, Minneapolis & Omaha Railway. South of the railroad the land is slightly undulating except for occasional flat areas of 4 or 5 square miles. The topography becomes somewhat more undulating nearer the two streams. On the divide between the West Fork and East Fork Vermilion Rivers lies a narrower strip of comparatively flat or slightly undulating territory, which varies from 2 to 4 miles in width and extends from the southern boundary of the county, northward, through Canistota and Salem, nearly to the Little Vermilion River. On each side of this flattish area the topography becomes more undulating as the West Fork Vermilion and Little Vermilion Rivers are approached. The topography also is undulating as it approaches what is known as "The Valley."

"The Valley" lies lower, has a distinct margin on the west, and extends from section 33 in Spring Valley Township to section 31 in Montrose Township. The topography of "The Valley" is uniformly undulating. The territory within the angle formed by the Little and East Fork Vermilion Rivers is slightly undulating to undulating, except for narrow strips of rather broken land along these two streams. These broken strips occur along both sides of these rivers and the gullies entering them, and represent the change from the upland to the bottom lands. They are seldom more than one-half mile wide and constitute the roughest land of the county.

All of the county lying east of the East Fork Vermilion River is uniformly more undulating than the rest of the county, and in Ramsey Township it may be described as rolling. It appears to be of morainal origin and includes some rather sharp gravelly knolls and a few lakes. Two other areas having a rather rolling topography are in the western part of the county, one in sections 5 and 6 of Pearl Township and the other in sections 5, 6, 7, 8, and 9 of Jefferson Township.

The greater part of McCook County is drained by three streams belonging to two different drainage systems. The western part is drained through Wolf Creek, which flows into the James River. The eastern part is drained by Little Vermilion and East Fork Vermilion Rivers, which converge just north of Montrose. The latter is the largest stream in the county. The central part of the county is drained through the West Fork Vermilion River.

All these streams are sluggish and carry very little water except in the spring, in wetter years, or just after heavy rainfalls. The stream channels are about 4 to 8 feet below the flood plains, and the streams seldom overflow except in the spring of the year, when rainfall is heaviest. Wolf Creek, West Fork, and Little Vermilion Rivers usually dry up and contain only isolated pools of water during the summer months. Wolf Creek has cut to a depth of about 40 to 60 feet below the upland and has a flood plain about one-fourth to one-half mile wide. West Fork Vermilion River has a flood plain of about the same width, but it is only about 20 to 30 feet below the upland. The East Fork Vermilion River is intrenched about 60 to 80 feet and has a valley about one-half mile wide. The channel of Little Vermilion River is deeply trenched where it flows into East Fork Vermilion River, but is only about 15 feet below the general surface at the county line. Its valley is about one-half mile wide.

It would seem that with this number of streams the drainage would everywhere be good, but this is not the case. The streams have not dissected the broad, flat divides, and large areas lying between streams have poor surface drainage. The largest area of this kind is in the eastern half of Pearl Township and extends south to the Chicago, St. Paul, Minneapolis & Omaha Railway. During heavy rains water remains on the flat surface for some time, as the internal drainage is not free.

In the undulating country south of the railroad the excess water flows to the lower areas or basins and forms lakes or ponds, in which water stands until it evaporates or sinks slowly into the ground. Some of these basins are under water for short periods, others dry up in the late summer or fall, and still others are permanent lakes. Similar drainage conditions prevail on the flatter parts of the divide between East Fork and West Fork Vermilion Rivers. Here dissection by the rivers is more advanced and the region of incomplete drainage is less extensive. It extends from the southern county line to Sun Prairie and Brookfield Townships, and in general follows the Chicago & North Western Railway through Canistota and Salem. The areas of restricted drainage are not confined to these divides, as they occur throughout the county. The narrow rather rough strips already described along East Fork Vermilion River are excessively drained, and erosion is rather severe during heavy rainfalls.

The boundaries of McCook County were established in 1873, but the county was not organized until May 16, 1878. The county seat

was at Cameron, which was south of the present location of Canistota, but was moved to Bridgewater in 1880 and to Salem in 1882. The first settlement was made in 1871 on the East Fork Vermilion River. Later settlers came mostly from Wisconsin, Iowa, or the Scandinavian countries. A number of Irish settled in the vicinity of Salem. The present inhabitants are mainly descendants of the early homesteaders.

The total population of McCook County was 9,990 in 1920, an increase of about 400 since 1910. The population is rather evenly distributed through the county, with an average density of 17.4 persons per square mile. The area occupied by "The Valley" is probably more densely populated than any other area of corresponding size in the county. The average number of dwellings per square mile for the county, excluding the towns, is 2.4, and is 2.7 per square mile for the area within "The Valley."

The chief towns are Salem, Spencer, Bridgewater, and Canistota. Montrose and Unityville are smaller towns. Salem is the county seat and has a population of 1,187. It is located near the center of the county, at the junction of two railroads.

The Chicago, St. Paul, Minneapolis & Omaha Railway, which reached Salem in 1881, crosses the county east and west through Montrose, Salem, and Spencer. The Chicago & North Western Railway crosses the county in a southeast-northwest direction, through Canistota, Salem, and Unityville. The Chicago, Milwaukee & St. Paul Railway crosses the southwestern corner of the county, passing through Bridgewater. Most of the farms lie within 9 miles of a shipping point, except in the northeastern corner of the county, where a few are 12 miles or more from a railroad station.

The principal outside markets are Sioux Falls, Sioux City, Minneapolis, and St. Paul. The first two are the principal livestock markets and the latter the principal grain market.

The county is well supplied with good rural and urban schools.

CLIMATE.

The climate of McCook County is typical of the prairie regions of South Dakota. It is characterized by a summer season of moderate length, with hot days and cool nights, and a rather long, severe winter, with temperatures prevailingly well below freezing.

According to the records of the Weather Bureau station at Alexandria, Hanson County, the mean annual temperature is 45.1° F. For the summer, the mean temperature is 70.4° F.; for the winter, 17° F.; and for the spring and fall, 44.8° F. and 48.1° F., respectively. The absolute maximum recorded is 110° F. in July, and the absolute minimum −41° F. in January.

The average annual snowfall is 22.6 inches. Sometimes the snowstorms are accompanied by strong winds, becoming what are known as blizzards. These storms have lost much of their former danger, since the county has become settled.

The average date of the last killing frost in spring is May 13 and the average date of the first in the fall is September 27. This gives an average growing season of 136 days. The latest killing frost recorded in the spring was on June 21 and the earliest in the fall on August 23. The growing season is usually long enough for maturing the small-eared varieties of corn that are grown in the county.

The mean annual rainfall, according to the records of the Alexandria station, is 24.27 inches. The total for the wettest year (1883) was 30.54 inches and for the driest year (1895) 16.69 inches. The rainfall is so distributed that the greater part falls during the growing season. The rainfall is ordinarily sufficient for crop needs, though crops may suffer from drought in July or August. The records of the station at Marion, in Turner County, shows a mean annual precipitation of 27.56 inches, and Sioux Falls, Minnehaha County, of 25.97 inches.

Normal monthly, seasonal, and annual temperature and precipitation at Alexandria, Hanson County.

[Elevation, 1,352 feet.]

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1895).	Total amount for the wettest year (1883).	Snow, average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
December	21.2	66	−37	0.59	T.	1.18	4.1
January	14.3	66	−41	.55	0.40	.35	4.3
February	15.6	70	−38	.61	.45	1.10	4.5
Winter	17.0	70	−41	1.75	.85	2.63	12.9
March	29.5	89	−24	1.39	1.05	.86	6.2
April	47.5	96	8	2.84	2.36	3.30	1.5
May	57.5	98	16	3.40	2.18	5.34	T.
Spring	44.8	98	−24	7.63	5.59	9.50	7.7
June	67.2	106	31	4.16	3.82	4.55	0
July	72.7	110	33	3.21	2.14	6.72	0
August	71.2	107	31	2.67	.27	3.80	0
Summer	70.4	110	31	10.04	6.23	15.07	0
September	61.9	109	15	2.25	2.50	1.68	0
October	49.8	94	−2	1.96	.20	1.60	0.3
November	32.5	80	−15	.64	1.32	.06	1.7
Fall	48.1	109	−15	4.85	4.02	3.34	2.0
Year	45.1	110	−41	24.27	16.69	30.54	22.6

AGRICULTURE.

Agriculture has always been the chief source of income in McCook County. The first settlers were largely engaged in stock raising, but quickly changed to grain growing after the building of the railroads. Wheat was the first important crop. The 1880 census reports the total area in wheat in 1879 as 1,052 acres. This increased rapidly until 1889, when wheat occupied 198,887 acres; in 1909 the acreage had decreased to 47,893 acres, and in 1919 to 42,521 acres. In 1921 very little wheat was sown in the county, probably not more than 25,000 acres. This decrease is largely due to the uncertainty of the crop, as it is often attacked by rust, blight, or other pests. Spring wheat has always been sown, but winter wheat produces better yields and is more certain and therefore is likely to become the principal kind soon. The average yield is about 10 to 12 bushels per acre, but varies from 3 to 30 bushels.

Corn was the second most important crop in the early days. In 1879 it was grown on a total acreage of 730 acres; this increased to 83,339 acres in 1919. Corn has been the leading crop since some time before 1910. The chief varieties grown are Wimples Yellow Dent and Minnesota No. 13. The corn is of the small-eared type, but the yields compare favorably with those of the larger-eared varieties grown farther south. The yields average 25 to 35 bushels per acre, but vary from 20 to 60 bushels.

Oats originally ranked third in acreage, but the acreage of oats has increased with the acreage of corn, until at present oats rank second in importance, with 70,329 acres in 1919, and in 1921, from observation, one would judge that the acreage was almost equal to that in corn. Swedish Select and Sixty Day oats are the principal varieties. The yields vary from 35 to 45 bushels per acre.

Barley has always been grown to considerable extent, but in recent years the acreage is comparatively small, being only 5,172 acres in 1919. Flax has generally been grown as a first crop when breaking the virgin sod, and consequently has declined as the area of new land has decreased. Rye, emmer, and spelt are minor crops. The land for grain crops is usually plowed in the fall, the oats, wheat, and barley stubble being plowed as soon as the crop has been removed. What can not be plowed in the fall is plowed early in spring. After plowing, the soil is disked or harrowed into a well-prepared seed bed. The average depth of plowing is 5 or 6 inches.

The bulk of the corn and oats is sold on the market, but part of it is used for feeding. The wheat is practically all sold.

Hay and forage crops were grown on 33,945 acres in 1919. Tame-hay crops, principally alfalfa, sweet clover, timothy, and timothy and clover mixed, were cut from 8,307 acres. The census gives 3,068 acres of alfalfa for 1919. The acreage in 1921 appears to be somewhat larger. Three cuttings are usually obtained. Sometimes part of the first cutting is lost, as it is usually cut during the rainy part of the spring. Ordinarily alfalfa and sweet clover are considered the best tame-hay crops, and rather large quantities are shipped out. Timothy and timothy and clover mixed are important forage crops, but are used mainly for feeding. The timothy is grown mostly on the flat areas having poor surface drainage. Clover was reported on 293 acres in 1919. It is grown chiefly for seed. Alfalfa is usually sown with wheat or oats as a nurse crop.

Prairie hay was harvested from 22,269 acres. Most of this hay comes from the low poorly drained spots that are usually too wet for cultivation, but dry up in the summer, permitting the cutting of the grasses.

The principal vegetable crop grown is potatoes, which occupied 797 acres in 1919. The acreage varies from year to year, but seems on the whole to be increasing. Most of the crop is used locally.

Fruits are of minor importance, being grown only in small orchards for family use. Apples lead with 4,076 trees and plums follow with 1,588 trees. Some cherries are grown. Not nearly enough of these fruits are produced to supply the demand. Strawberries are the only small fruit grown, and the 1920 census reported only 4 acres of this crop. It would seem that fruits for home use should be grown more extensively.

The 1920 census gives a total value of cereals produced in 1919 as $5,615,108; hay and forage, $710,236; vegetables, $129,368. Of these three classes of crops, hay and forage showed the greatest increase in value as compared with the values in 1910.

Livestock and livestock products also furnish a large amount of income to the farmers of the county. The value of animals sold and slaughtered, the most important item under this heading, jumped from $227,022 in 1899 to $700,660 in 1909, and probably exceeded this amount in 1919. The principal animals raised for market are good grades of beef cattle and hogs. The practice of turning hogs into the corn is followed to some extent. The value of corn lost in harvesting the crop in this way is considered less than the cost of gathering it in the ordinary way.

Poultry and poultry products are rapidly coming to the front as a source of income. The value of these advanced from $27,626 in 1899 to $355,080 in 1919. Although most of the poultry is raised for home use, the surplus for sale is considerable. No commercial poultry farms were seen in the county. Most all breeds of chickens are represented in the farm flocks.

Dairying ranks next to poultry keeping as a source of income, the value of dairy products, exclusive of home use, amounting to $248,955 in 1919. There are some strictly dairy farms in the county, but most of the product is surplus above the farmer's needs. The leading breeds are Holstein, Jersey, and Guernsey.

Purebred cattle and hogs are being raised on several farms in the county. The most popular breed of cattle bred is Hereford, and the principal breeds of hogs are Poland-China and Duroc.

The 1920 census reports a total of 1,253 farms in the county, with an average size of 256.8 acres. Of the total area of the county 87.7 per cent is in farms. Of this 86.2 per cent is improved land, or an average of 221.5 acres of improved land per farm.

The average value of the farms in 1880 was $923.42. The value gradually increased to $18,812 in 1910 and jumped to $50,466 in 1920. The assessed value of the land increased from $16.38 per acre in 1900 to $160.13 in 1920. The greatest increase was in 1918 and 1919, just after the World War, the price of land in some instances increasing over $100 an acre during these years.

The largest item of farm expense is for labor. In 1919, 1,049 farms reported an expenditure for labor of $540,924, or $515.66 per farm reporting. Feed is the other important farm expense. This amounted to $325.51 per farm on 599 farms in 1919. However, the expense of labor and feed has become somewhat lower since the census was taken.

The total amount expended for fertilizer was reported as $300 for 1889 and $205 in 1909. None is reported by the 1920 census. The small outlay for fertilizer is significant; it follows from the natural productiveness of the soil.

Most of the farmers practice some sort of rotation. This is usually corn, oats, and alfalfa or sweet clover. Corn may be grown for 2 or 3 years, and the legume crop for 4 or 5 years. The legume crop is rarely turned under. However, considerable green manure is added when the land is plowed in the fall, as weeds, pigeon grass, and foxtail grow luxuriantly after the small grains are cut. Most farmers conserve the barnyard manure and apply it to the thinner patches of

soil or to the alkali spots on their land. The shortage in livestock makes the supply of manure very inadequate.

Of the total number of farms in the county in 1920, 47.7 per cent were operated by owners, 0.5 per cent by managers, and 51.8 per cent by tenants. In 1890 only 13.29 per cent of the farms were operated by tenants. There thus has been a rapid increase in tenant farming. Farms are rented for cash rent or for a share of the crops. The terms of the leases vary considerably.

The average farm is improved with good buildings and fences, and is well equipped with farm machinery and implements. Two-row cultivators are in general use. Tractors are in common use, the smaller types appearing to be the most popular. The average tractor used pulls two plow bottoms; some are used with three plows. Most of the plowing is done with five horses and a two-bottom riding plow.

SOILS.

The soils of McCook County show by their most important characteristics the predominating influences of climate in their development. Climatic conditions, uniform for the entire area, have acted upon materials assumed to have been variable in character and have produced soils that are remarkably uniform in appearance and composition. The minor variations are produced by differences in the texture of the original material or by restricted drainage, both of which have retarded or modified the action of the soil-forming processes.

The comparatively low moisture supply of the region has not been sufficient to support a forest vegetation but has been quite favorable to the growth of a covering of short grasses. These grasses have been the source of the humus which imparts the black color to all the soils of the region. While the soil water is thus ample to permit the production and accumulation of large quantities of black organic matter from the decay of the grass roots, it is not sufficient to leach the soil to any great depth. On well-drained areas, the carbonates, mainly lime carbonate, occur only in small quantities in the surface soil, the low amount being due to a partial leaching, but they are in such abundance below the depths of 18 to 24 inches that an actual concentration is indicated.

The soil of the well-drained upland has reached a fairly uniform stage and one that may be regarded as mature for this climatic zone. The typical profile to a depth of 36 inches is characterized by three distinct layers—a very dark brown, almost black, loose, finely granular soil; a brown heavy upper subsoil; and a light-colored, friable, often floury, lower subsoil. The two upper layers are not highly calcareous and very rarely effervesce when tested with acid. The lower subsoil contains a very large percentage of lime and other carbonates, including not only the quantities in the parent material but probably a concentration from above and below. Soils which have reached this stage of development on the upland are shown on the soil map as soils of the Barnes series. The Bearden series on the higher terraces has the profile just described and in a broad classification belongs to the same group. The Sioux series has a loose, porous subsoil, and excessive drainage has prevented a large accumulation of lime, but the subsoil is nevertheless distinctly calcareous.

The soils of the Beadle series, which occur on the nearly level areas of upland, differ from the Barnes group in having an extremely heavy and compact upper subsoil. This heavy claypan is no doubt due mainly to the influence of restricted drainage, but it is believed that the extreme thickness and compactness of this layer in certain localities has been brought about in part by the nature of the parent material.

Soils occurring on areas of still more restricted drainage, such as prevails in the upland depressions, flat terraces, and low flood plains, have developed a distinct profile. The surface soils are deep and black and overlie gray or mottled, highly calcareous, heavy-textured subsoils. Such soils in the poorly drained uplands and terraces have been classed with the Fargo series and on the stream bottoms with the Lamoure series.

The soils of the groups mentioned have been classified into soil series on the basis of differences in structure, in details of the soil profile, and in the source, character, and mode of accumulation of the material from which the soils have been derived. The series are divided into soil types on the basis of difference in the texture of the surface soil.

With respect to the source of the parent material, the soils of McCook County may be placed in two groups, glacial soils and alluvial soils. The glacial material, which was deposited by the Wisconsin ice sheet, consists of ground-up débris from various rocks from the north, such as granites and gneiss, mixed with that from the more local formations, such as quartzite (Sioux Falls), sandstone, and shale. Upon melting, the ice deposited this mass with a fairly smooth surface. Since deposition it has undergone changes under the action of the various weathering agencies and the surface has developed definite types of soil.

The alluvial soils were formed from material carried from the surrounding upland and deposited by the streams on their flood plains. These may be divided into old-alluvial and recent-alluvial soils. During the melting of the glacier the streams of the area carried more water and deposited their burden over wide flood plains, and since then the diminished streams have cut deeper channels in these older flood plains, leaving them above overflow. They now exist as second bottoms, bench lands, or terraces, upon which mature soils have been developed, including the Bearden and Sioux series. The present flood plains have developed the recent-alluvial soils, which are classed with the Lamoure series.

The effect of stream erosion has not been severe and is important only along East Fork Vermilion River and the southern part of Wolf Creek. Here the streams have rather thoroughly dissected a narrow strip, eroding the surface soil and exposing the subsoil. This condition is more noticeable along East Fork Vermilion River than elsewhere. Wind erosion has not been very active, but affects to a small extent those parts of Spring Valley, Greenland, and Montrose Townships lying west of East Fork Vermilion River. The areas most affected are in section 31 of Montrose Township and sections 6, 7, 18, 19, and 30 of Greenland Township. Here the soil is subject to drifting if left exposed, and the surface soil is being removed from the higher areas and deposited in the lower areas.

There are some outcroppings of Sioux Falls quartzite and limestone along East Fork Vermilion River in sections 14 and 23 of Spring Valley Township, but they are buried either under glacial drift or alluvial soils and have exerted very little influence upon the soils.

The types of the Barnes series are by far the most extensively distributed soils of the county. The surface soils of this series vary from dark brown to black in color; the subsurface is dark brown in color, and the subsoil is yellow, with streaks of limy material and mottlings of iron stains. The internal drainage is good. The Barnes loam, stony loam, very fine sandy loam, and silt loam, and a flat phase of the silt loam are mapped in this county.

The types of the Beadle series are very similar to those of the Barnes series. The chief difference is the presence of a well-developed claypan in the upper subsoil of the Beadle, which gives poorer internal drainage. The surface soil is dark brown or black, and the subsoil is a brown, or dark-brown, heavy, compact, impervious clay, underlain by a yellow material similar to that in the Barnes subsoil, but often more highly mottled with iron and lime. The Beadle silt loam is the only type of the series mapped.

The types of the Fargo series are of lacustrine origin. The surface soils are black and rather friable and gradually become heavier with depth. The subsoil is heavy, rather plastic, and dark in color, varying from a drab to brown or black, and practically always contains considerable lime. The silty clay loam type of this series is mapped.

The Sioux series has dark-brown to black, friable surface soils grading into a brown, friable upper subsoil of the same texture or slightly heavier. This is underlain at an average depth of about 24 inches by stratified sands and gravels. The loam is the only type mapped.

The Bearden series has dark-brown or black surface soils, a brown, rather friable, heavy subsurface layer, and a yellow, friable, calcareous subsoil. These types correspond in profile to the Barnes soils of the upland, but are developed on second bottoms or terraces. Two types were mapped, the loam and the silt loam.

The recent-alluvial or present flood-plain soils are of the Lamoure series. These soils are very similar in appearance to the Fargo soils. They have dark-brown or black surface soils, with a heavier subsoil of the same color or ranging from drab to dark brown. The subsoil is usually highly calcareous and in many places the surface soils also are calcareous. Two types were mapped, the loam and the silt loam.

In the following pages of this report the soil types are described in detail. Their distribution is shown on the accompanying soil map.

The table below gives the area and relative extent of the different soil types:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Barnes silt loam	176,960	52.8	Barnes stony loam	6,784	1.8
Flat phase	16,512		Bearden silt loam	2,496	.7
Barnes loam	104,192	28.4	Barnes very fine sandy loam	2,368	.6
Fargo silty clay loam	20,480	5.6	Lamoure loam	1,536	.4
Beadle silt loam	16,000	4.4	Bearden loam	1,344	.4
Lamoure silt loam	9,280	2.5			
Sioux loam	8,768	2.4	Total	366,720	

BARNES STONY LOAM.

The Barnes stony loam differs from the Barnes loam mainly in its more rolling topography and the presence of large quantities of gravel and stone. The surface soil is a dark-brown to black loam containing a relatively large proportion of the coarser grades of sand. This surface soil extends to a depth of 3 to 10 inches, where it grades into a brown silty clay loam subsoil, which passes, at depths ranging from 14 to 20 inches, into the yellow silty clay loam characterizing all the Barnes soils. This yellow layer has a larger proportion of gravel, however, than is found in the same layer in the other Barnes types. Large quantities of stones and gravel are scattered over the surface and through the soil section, and the places where they are most abundant are indicated on the map by symbols.

This type is confined largely to narrow strips along Little and East Fork Vermilion Rivers and their tributaries. Two other areas are mapped in the northeast corner of Montrose Township. The areas bordering the streams are seldom more than one-fourth mile wide and represent a drop of about 70 to 85 feet from the upland to the bottom land.

Very little of this type is in cultivation. In the few cultivated fields the soil is very shallow on the tops of the ridges and knolls and the subsoil is often brought to the surface. The rough topography, the shallowness of the soil, and the presence of rather large quantities of gravel or stones reduce the value of the type for farming.

As a whole it is suited only for grazing, and practically all of it is used for pasture. This land is sold in conjunction with the bottom land and surrounding soils, and consequently brings prices that are considerably higher than the agricultural value of the type, taken separately, would warrant.

BARNES VERY FINE SANDY LOAM.

The surface soil of the Barnes very fine sandy loam is a brown to nearly black, mellow very fine sandy loam, extending to a depth of about 4 to 10 inches. Below this it normally grades into a brown or dark-brown loam, which extends to 14 or 20 inches, where the typical grayish-yellow, friable, silty clay loam subsoil layer is encountered. In some borings the lower subsoil is not heavier than the overlying material, but has the typical color. A few borings show a slightly sandier layer below the brown layer.

The Barnes very fine sandy loam is mapped chiefly in Greenland and Montrose Townships. It occurs at the outer edge of The Valley along slopes at the heads and bends of small streams flowing into the East Fork Vermilion River.

This type is drifted by the wind and should not be left exposed for long periods after plowing. It is considered a good corn soil, as it warms up early in the spring, permitting early planting. Corn is the leading crop. Several good fields of alfalfa were noted. The yield is about the same as on other soils. This type usually sells at about the same price as the surrounding Barnes soils. On some of the shallower spots crops sometimes suffer from drought, but the greater part of the type is retentive of moisture.

BARNES LOAM.

The Barnes loam ranks second in area and importance among the soils of McCook County. The surface soil is a dark-brown to black friable loam, 4 to 10 inches deep. The subsoil is a brown friable silt loam, grading at about 20 to 24 inches into a yellow friable silty clay loam, mottled with occasional iron stains and lime stains and containing some lime concretions and gravel.

The type is developed along the streams and in the more undulating or rolling country. The largest bodies are situated along Wolf Creek and East Fork and West Fork Vermilion Rivers.

The area in the northwest corner of Jefferson Township is rather rolling and includes a number of rather sharp but comparatively low knolls. The surface soil on the tops of these knolls is rather shallow, in places the brown subsurface layer lying only 3 or 4 inches below the surface. On the slopes the soil is deeper and is deepest in the swales between the knolls. In cultivated fields the tops of these knolls show patches of 1 to 2 acres where the subsoil has been brought to the surface by plowing.

Similar conditions exist on the north side of Little Vermilion River in sections 25, 26, 27, 34, 35, and 36, Brookfield Township, along this stream to its junction with the East Fork Vermilion River, and thence north to the county line. This strip is about 1 mile wide. Another similar strip lies along the south side of the Little Vermilion River and the west side of the East Fork Vermilion River. The surface soil in the rougher parts of these areas is usually shallower and contains a slightly larger proportion of the coarser sand grades than the soil on the level or less rolling areas. In Ramsey Township the type is also rather rolling and the surface soil rather shallow, especially around the lakes and the areas of Fargo soils. In Montrose Township east of the river the type is strongly undulating to rolling and has a more uniform surface soil. The other areas east of the river are rolling.

The areas mapped in the northwest corner of Jefferson Township and in Brookfield and Ramsey Townships appear to be composed to some extent of terminal-moraine material and they therefore have a higher content of gravel than the rest of the type. The rolling morainal areas usually have a rather large proportion of inclosed areas with restricted drainage. These are rather numerous in the northeast corner of the county and are of much larger size than those occurring on the silt loam type. Some of those in the northeast corner are large enough and receive enough water to maintain them as marshy places or permanent lakes.

From the standpoint of cropping, the Barnes loam ranks favorably with the silt loam, and by many is considered much surer than the flat phase of the silt loam. As it is lighter, more open, and better drained than most of the silt loam, it warms up earlier in the spring, thus permitting earlier cultivation and seeding. The same crops are grown on this soil as on the silt loam, and the yields are also about the same. Corn is the most important crop. This type is not considered as good as the silt loam for the smaller grains.

The Barnes loam as a whole is well drained. The spots of Fargo soil are not as numerous on this type as on the silt loam. Probably a larger proportion of the loam than of the silt loam is in pasture, espe-

cially in the more rolling areas. The price, excepting the more rolling areas, is about equal to that of the silt loam.

A somewhat finer grained variation of the Barnes loam is one of the most highly prized soils in the county. The surface soil when wet has the appearance of a silt loam, but when dry has the feel and appearance of a very fine sandy loam or loam, showing that the chief constituents are silt and very fine sand. The surface soil is friable and mellow, dark brown to black in color, and extends to a depth of 4 to 10 inches, where it grades into a brown fine-grained loam, or silt loam and at 24 to 30 inches grades into the typical yellow Barnes subsoil of friable silty clay loam or silty clay, with many lime stains and lime concretions. In a few places near areas of Barnes very fine sandy loam the deep subsoil has a very fine sandy loam texture. On the tops of some of the sharper knolls the surface soil is only 3 or 4 inches deep.

This soil occurs in one area on the west side of the East Fork Vermilion River, extending from section 28 of Brookfield Township south to the county line. The greater part of the area is in what is known as The Valley, which is a strip of territory about 3 miles wide just west of the river. Its western boundary extends from section 33 of Spring Valley Township to section 31 of Montrose Township; north of this it is indistinct.

As a whole it is readily distinguished from the upland to the west, being several feet lower and of a more uniform undulating to very gently rolling topography. The soil bordering this valley on the west is very similar in texture and soil section and was included with this type. During strong winds the soil drifts to some extent, especially in cultivated and exposed fields, but this does not appear to be serious.

Owing to the open structure and good surface drainage of this soil, there is very little danger of its becoming so wet that crops will drown out. At the same time the fine uniform texture and structure give it a maximum water-holding capacity, so that it is not seriously affected by droughts. The shallower soil on the tops of some knolls is slightly more sandy and is affected by prolonged droughts. Corn does not yield much more than on the other soils, but is more certain to mature, as it can be planted earlier and is not likely to be retarded by rain or drought. Corn averages about 35 to 40 bushels per acre. The soil is not so well adapted to wheat as are the heavier soils. Oats do better on it than wheat, the yields comparing favorably with those obtained on the other soils. Alfalfa and sweet clover are very productive, but are not extensively grown. This land is sold at about the same price as the other Barnes soils.

BARNES SILT LOAM.

The Barnes silt loam is by far the most important and extensive soil type mapped. It covers about half the area of the county. It is especially important in the western two-thirds of the county, and smaller areas appear throughout the eastern part. The type occupies most of Benton, Salem, Jefferson, Emery, Bridgewater, Union, and Grant Townships, and about half of Pearl, Sun Prairie, and Richland Townships.

The surface soil of the Barnes silt loam is a rather heavy, dark-brown to black, friable silt loam ranging in depth from 6 to 16 inches, the average depth being about 8 inches. This grades into a brown, friable, heavy silt loam or silty clay loam extending to an average depth of 20 to 24 inches, where it passes into a moderately friable, grayish-yellow or yellow silty clay loam containing an abundance of lime stains and some lime concretions, iron stains, sand, and gravel. The gravel is rarely present in sufficient quantities to exert any influence on the soil. In places the lime and iron stains give this yellow layer the appearance of being mottled with gray and brown.

This type generally has excellent internal drainage and good aeration. On the divide between East Fork and West Fork Vermilion Rivers and south of the Chicago, St. Paul, Minneapolis & Omaha Railway on the divide between West Fork Vermilion River and Wolf Creek the internal drainage is less complete, and as the areas lack adequate channels to carry the run-off in wetter years water collects in spots, causing considerable damage. In these lower places both surface and subsoil are commonly heavier than typical, alkali crusts form in places, and crystals of some of the salts occur in the subsoil. Many of the lower lying areas have a surface layer of soil which has been washed from the surrounding land. Such places are usually wet in the spring and in wetter years, causing delay in seeding.

The Barnes silt loam, as mapped, includes some variations. Where the type has a more undulating topography and lies closer to streams it appears to be slightly lighter in texture and in places approaches a loam. In section 23 of Ramsey Township and sections 10 and 15 of Montrose Township the type is flat and has a heavier subsoil, and the soil profile is similar to that of the Bearden silt loam. The gravelly till is seldom encountered within the 3-foot section. In many places the black surface soil is only 4 or 5 inches deep; this is more common in the eastern part of the county, where the topography is more undulating or rolling, but sometimes occurs on the flatter areas, as in section 31 of Brookfield Township. Many patches of Fargo soil too small to map were included in this type.

The greater part of the Barnes silt loam has a level to undulating topography. East of the East Fork Vermilion River it is rolling in the northern part of the county and less rolling in the southern part.

Practically all the Barnes silt loam is cultivated. A few areas are used for pasture, but these are cultivable. The chief crops are corn, oats, legumes (alfalfa or sweet clover), and some wheat. The ground is usually broken in the fall, and planting is done in the spring as soon as danger from frost is past.

The corn is usually check-rowed. The two principal varieties are Minnesota No. 13 and Wimples Yellow Dent. These varieties seldom fail to mature, except in years with extremely late springs and early frost. They produce ears of medium size and yield 30 to 35 bushels per acre in average years. No adequate preparations are made for storing the surplus in years of large production, most of it being placed in open cribs constructed of woven wire or picket fencing. This exposes the grain to the weather more or less and causes considerable loss. It is estimated that corn will deteriorate from 8 to 20 per cent under these conditions.

Alfalfa gives an average of about 3 cuttings, with a total yield of 2 to 3 tons or more. The hay from the first cutting is often damaged by the spring rains.

Improved drainage has benefited the lower and poorly drained areas. This not only removes the surplus water but also the small accumulations of alkali that may be associated with these areas. Farms that had been tiled in these lower places reported little damage from water during 1920.

The Barnes silt loam is valued at $100 to $200 an acre, depending upon improvements and location.

Barnes silt loam, flat phase.—The Barnes silt loam, flat phase, really includes two distinct soils, but they occur in narrow areas and are so intermixed that a separation on the map was impracticable. Where the country is level and drainage is slow, the surface locally is hummocky or undulating. On the higher, better drained ridges in such areas the Barnes silt loam is fairly well developed; on the very flat to depressed areas a soil similar to the Fargo silty clay loam is developed. The higher part of the Barnes silt loam, flat phase, is very similar to the typical silt loam, the principal difference being in the effects of less perfect drainage. The surface soil is a black or dark-brown friable silt loam, about 6 to 10 inches deep. This grades into a brown silty clay loam, which passes at an average depth of about 24 inches into the yellow highly calcareous silty clay loam, or typical Barnes subsoil. The lower subsoil usually is mottled with brown or stained with iron. Some alkali salts also appear in this section of the profile.

The soil includes many areas of Fargo silt loam and silty clay loam that are too small to separate with any degree of accuracy. These spots have a black surface soil gradually becoming heavier with depth and passing at about 24 to 30 inches into a plastic silty clay or clay which varies in color from black to brown or drab. Other included areas do not have the heavy black subsoil of the Fargo but do have a deeper surface soil and a slightly heavier subsoil than the typical Barnes. In some of these areas there is some indication of a heavy clay layer at about 2 feet, which is an approach toward the Beadle soils. This is true of some borings in sections 5 and 8 of Salem Township and sections 14, 15, 22, and 23 of Jefferson Township. Small accumulations of alkali are associated with these low spots.

During the summer of 1920 the crops on this phase were seriously affected, because the water that stood upon it made much of it uncultivable and more of it inaccessible. The phase is also affected more by droughts than the typical Barnes silt loam. The spots of heavy Fargo soil dry out and bake long before the Barnes soils begin to show any effect of drought. During the summer of 1921, a dry year, these heavier spots were easily distinguishable because of the stunted growth of the corn. Oats did not show the effect so badly as they were practically matured before the drought developed. This condition is exceptional, however, for in ordinary years these spots produce well and do not differ greatly in yields from the better Barnes soils. They produce best in seasons having a rainfall well distributed but not heavy enough to saturate the soil. In such years corn, alfalfa, and sweet clover do well, and small grains (oats and wheat) usually give good results. On many farms this soil is used for pasture.

BEADLE SILT LOAM.

The surface soil of the Beadle silt loam varies from a silt loam to a heavy silt loam in texture and from dark brown to black in color, and extends to a depth of 8 to 20 inches. Below this is a layer of heavy compact clay which varies in color from brown to dark grayish brown or black, the darkest color being found in the lower situations. This layer is 4 to 10 inches thick and extends to depths of 12 to 24 inches, where it passes into a rather friable heavy silty clay subsoil which is yellow, olive brown, or mottled yellow and drab in color and has a high content of lime. The road cuts show that the heavy layer approaches and recedes from the surface in a rather undulating line, and this configuration has no relation to the surface topography. For instance, the heavy layer may be nearer the surface on the elevated areas and deeper in the lower spots, or vice versa. A few borings showed a distinct gray, rather floury layer just above the heavy compact clay layer; this gray layer is indicative of poorer internal drainage. Some alkali is found on the surface, and where it is present in very small quantities it gives the surface a grayish cast. Crystals of alkali salts occur throughout the lower part of the soil section, also indicating poor internal drainage.

Practically all this type is mapped in the northwest corner of the county, in one area which is several miles wide at the county line, gradually narrowing off to a point at its southern extremity. Spots of Barnes silt loam were encountered throughout the area, commonly in the higher and better drained situations. The type is level and comprises the flattest part of McCook County. Numerous small areas lying a foot or two lower than the surrounding land appear throughout the type, but these differ from the depressions in the Barnes soils in that they are not sufficiently developed to give rise to the Fargo soils.

As a whole the Beadle silt loam is considered less desirable than the Barnes soils as it is likely to remain wet in the spring long enough seriously to delay the planting of crops. During wet years the crops are sometimes seriously damaged by excess moisture, because the heavy clay layer prevents the downward movement of the water and the surface drainage is very poor, only one small stream entering the area. During the drier years the crops are seriously affected by drought as the heavy subsoil prevents a maximum storage of water. The heavy layer also hinders root development, especially where it is near the surface. However, in spite of all these drawbacks, very good crops are produced on this soil. Most crops do best during average seasons when the rainfall is well distributed.

Small grains are considered the crops best adapted to this soil. It is rather heavy and compact for corn, the yields being a little lower than those obtained on the Barnes soils. The heavy subsoil also makes it more adaptable for the shallower rooted crops, though alfalfa seems to do very well on some of the better parts. The lower areas having a heavy claypan nearest the surface are usually left in pasture where pasture is needed. The farms are well improved and the land is valued rather highly, practically all of it being held at $100 or more an acre.

The table following gives the results of mechanical analyses of samples of the soil, subsurface, and subsoil of the Beadle silt loam.

Mechanical analyses of Beadle silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
360515.....	Soil, 0 to 9 inches	1.4	2.3	1.6	8.2	17.8	49.4	19.6
360516.....	Subsurface, 9 to 21 inches..	1.2	3.6	3.0	17.4	10.4	36.1	28.4
360517.....	Subsoil, 21 to 42 inches....	.8	4.2	3.1	16.9	14.8	29.2	30.3

FARGO SILTY CLAY LOAM.

The surface soil of the Fargo silty clay loam is a dark-brown or almost black, slighty granular silty clay loam. This gradually becomes heavier with depth and grades into a clay at depths ranging from 15 to 24 inches. The clay may be drab or brown or continue black throughout the 3-foot section. Some of the areas contain small accumulations of alkali. The larger areas are in most places covered with a layer of 2 or 3 inches of organic matter derived from the abundant plant life growing in the wetter areas of this soil. This covering of organic matter disappears after a few years of cultivation.

The areas of this type are scattered throughout the county and occupy the small and large depressions which receive drainage from the adjacent Barnes soils. The soil particles washed from the higher soils are deposited in these depressions, and as the water becomes shallower, plant life flourishes, with accumulation of large quantities of organic matter. The color of the soil is determined by the porportion of organic matter present.

Most of the areas of Fargo silty clay loam are irregular in shape and range in size from 3 acres to 50 acres or more. Many of the smaller areas are cultivated when the spring season is not too wet. On some farms these spots are plowed in the fall as soon as they become dry enough, and in this way they can often be utilized when otherwise it would be impossible. Some areas are under water long enough in the spring to prevent any planting of crops. These usually support a luxuriant growth of native grasses which are cut for hay after the water has evaporated. The larger areas are sometimes wet throughout the year, and where they are wet the greater part of the year various water plants grow in abundance. Such areas are distinguished on the map by swamp symbols, to show that they are of little value except in the drier seasons, when some hay is cut.

The large continuous area mapped as Fargo silty clay loam along the small stream flowing through sections 8 and 9 of Greenland Township appears to belong with the Lamoure soils, but is in reality closely related to the Fargo soils, is poorly drained and wet during years of heavy rainfall, and is also heavier than most of the bottom land. For these reasons it was included in the Fargo soils.

Only some of the shallower and smaller areas of this type are consistently cultivated, and crops on these are usually drowned out during such wet years as 1920. The chief use of this type at present is for pasture and native hay. In the sale of land these spots are not taken into account unless they are large and very wet.

Where possible this soil should be drained and cultivated. If drained, it would be a good soil for all the crops grown at present in

the county. On farms where these wet places had been tiled, very little loss was suffered from drowning out during the wet season of 1920.

BEARDEN LOAM.

The surface soil of the Bearden loam is a dark-brown to black friable loam to heavy loam about 12 inches deep. This grades into a yellow friable silty clay loam containing considerable lime. A few areas of rather sandy loam are included with this type in mapping. The largest of these areas is located in section 6 of Grant Township.

Most of the Bearden loam occurs along the East Fork Vermilion River, in the two southern townships, where it occupies rather small areas on old stream terraces now lying above overflow. The surface is flat or has a slight gradient toward the stream. The type has good surface and internal drainage, enabling it to take care of a rather large volume of rainfall without damage to crops. Practically all the type is planted to corn, for which it is an excellent soil, producing about 30 to 40 bushels per acre. It is sold in conjunction with the surrounding upland and bottom-land soils.

A variation of the Bearden loam occurring on colluvial slopes was mapped along the East Fork Vermilion River. It has a small total area and occupies narrow strips bordering the bottom soils, at the base of bluffs that rise from the bottom lands. It is derived from the top soil being washed from the surrounding upland and deposited at the base of the slopes. It also includes deposits of the rather short streams that have cut back into the surrounding upland.

The surface soil of this variation is a black friable loam extending to a depth of 20 or 24 inches, where it passes into a brown, friable silty clay loam layer, which is underlain by a yellow, calcareous silty clay loam.

This soil is not affected to any extent by droughts, but during heavy showers the sediment washed in by the short gullies sometimes buries seedling plants. As a whole it is a valuable soil. Most of it is planted to corn, which yields an average of 40 bushels or more per acre. Alfalfa, probably the second most important crop, yields about the same as on the other Bearden soils.

The following table gives the results of mechanical analyses of samples of the soil, subsurface, and subsoil of the typical Bearden loam:

Mechanical analyses of Bearden loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
360524.....	Soil, 0 to 12 inches.....	0.8	2.4	2.0	8.8	16.7	46.2	23.2
360525.....	Subsurface, 12 to 22 inches	.4	1.8	1.4	6.4	14.0	51.0	24.8
360526.....	Subsoil, 22 to 42 inches ...	.2	1.0	.6	9.2	23.6	41.1	24.3

BEARDEN SILT LOAM.

The Bearden silt loam is the terrace equivalent of the Barnes silt loam of the upland. The surface soil is a dark-brown to nearly black, smooth, friable silt loam extending to depths of 8 to 14 inches. This grades into a brown silt loam which passes at 24 to 28 inches into a

friable yellow silty clay loam. The subsoil is for the most part highly calcareous. Borings in sections 2 and 11 of Richland Township, section 17 of Montrose Township, section 19 of Greenland Township, and in various places along the East Fork Vermilion River, gave material that did not effervesce with acid. In places the yellow layer is absent, the brown material extending to a depth of 36 inches, and in some of these places there is no lime carbonate in the soil section.

On some of the slightly higher elevations along the East Fork Vermilion River north of Montrose gravel is encountered at about 34 or 36 inches. The profile here resembles that of the Sioux soils, except that the gravel bed appears at a much lower depth. The spots are all small, and as they showed no signs of being droughty in 1921 (which was a dry year) and no difference in productiveness, these spots were all classed as Bearden.

As a rule, the Bearden silt loam occupies old stream bottoms that are now above overflow except in years of extremely heavy rainfall. The type is mapped principally along the East Fork Vermilion and Little Vermilion Rivers, the greater part being located along the East Fork, in Ramsey, Montrose, and Greenland Townships. Other areas are in sections 18 and 19 of Greenland Township. The type as a whole is well drained, a gentle slope toward the streams favoring run-off.

The area in section 21 of Ramsey Towhship has some sandy spots due to the wash from the surrounding upland, and these spots are sometimes affected by severe droughts. However, they are small, individually and in total area, and for this reason have been included with the silt loam.

The Bearden silt loam is productive and well adapted to the crops grown in the county. Most of it is planted to corn, with yields averaging about 40 bushels per acre, and under most favorable conditions reaching 70 bushels. Good yields of oats, sweet clover, and alfalfa are obtained. The farms are well improved and the land is valued very highly. It is sold in conjunction with the surrounding upland and bottom lands.

SIOUX LOAM.

The Sioux loam has an open, friable surface soil, 6 to 12 inches deep and of brown to dark-brown color. When wet it appears black. It grades into a friable brown loam or silt loam, which passes at depths of 18 to 20 inches into a bed of stratified sand and gravel.

The depth at which the gravel bed is encountered varies greatly. A few areas include small knolls, and on these the covering of soil above the gravel is commonly shallower, lighter textured, and more droughty than typical. Spots of this kind are found in section 24 of Sun Prairie Township, section 24 of Emery Township, and in the two small areas in sections 18 and 19 of Grant Township. The soil layer is several inches thinner on the outer edges of the areas and near the streams. In the western half of section 2 of Richland Township the type lies 10 or 15 feet higher than in the eastern part of the section.

This type is generally considered a desirable soil, as its open porous structure enables it to dry out and warm up earlier in the spring than most of the other soils, and this makes earlier planting possible. During average years, when rainfall is well distributed,

good yields are obtained, but in the drier years, such as 1921, the crops are seriously affected by drought, those on the shallower and lighter textured spots being the first to show injury. The porous subsoil allows the water to seep downward and does not act as a reservoir for the moisture like the friable clay subsoils. During wet years this type gives excellent results, as the surplus water is rapidly carried away through the open subsoil.

The type occupies terraces along all the streams in the county, but principally along the West Fork and Little Vermilion Rivers. The topography is practically flat or gently sloping, but contains some slight knolls and in places it becomes slightly undulating near the margin next to the upland.

Corn is the principal crop. In average years it yields about as well as on the Barnes soils, but in the drier years it suffers considerably from drought. Oats do not yield as well as on the other soils. Alfalfa does well sometimes, but as a rule gives one cutting less, owing to lack of growth during dry weather.

In transfers made during the last few years this type of land has brought prices almost as high as the Barnes soils, but the farmers recognize it as being a rather uncertain soil and do not consider it quite as valuable as the well-drained Barnes soils.

LAMOURE LOAM.

The surface soil of the Lamoure loam is a dark-brown to nearly black loam, 10 to 14 inches deep. This grades into a grayish-brown, black or slightly drab, heavier loam or silty clay loam, which extends to 36 inches. Where the subsoil is heaviest the color is usually dark drab or black.

This type is confined to a rather narrow strip of bottom land along the course of East Fork Vermilion River in Greenland and Spring Valley Townships. This area is comparatively flat, but most of it has a slight slope toward the stream. Some of the areas at the mouths of small gullies are rather wet. The greater part of the type, however, is above the usual overflows.

Most of the wetter and lower areas are in pasture. The higher areas are considered very good farming land. Corn and alfalfa are the principal crops. The mellow and rather open structure of the soil makes it well suited to the production of corn. Alfalfa generally gives good yields. Some of the sandy strips next to the stream are subject to drought and in the drier years seldom yield more than one cutting of alfalfa. These areas usually contain less than an acre. In places they are sandier in the subsoil and have excessive drainage. The higher parts of the Lamoure loam contain more or less colluvial material, and the boundary between this type and the colluvial variation of the Bearden loam is often very indistinct. The lower and wetter areas that are not used for pasture support a good growth of wild grasses, which are cut for hay. In the sale of farms this type is included with the adjacent upland.

LAMOURE SILT LOAM.

The Lamoure silt loam is a friable dark-brown or black silt loam to a depth of 10 to 15 inches, where it grades into a dark-brown silty clay loam, and at about 20 to 24 inches it grades into a drab, dark-

brown, or black clay. The color of the subsoil depends upon the conditions of drainage and aeration. Lime is normally present throughout the soil section, especially in the lower half. Some areas have enough lime on the surface to give the soil a rather grayish color. In some borings the subsoil was only slightly heavier than the surface soil.

This type comprises the present flood plains and is subject to overflow. It occurs along the streams in comparatively narrow strips, rarely more than a quarter of a mile in width. The widest areas are along Little and East Fork Vermilion Rivers.

A number of small areas that are rather wet could be profitably drained, such as the area in section 17 of Ramsey Township and another on the west side of section 20 in Montrose Township, and in many other places throughout the type. Along Little Vermilion River the type appears to be lower and wetter than most of the type along the other streams.

Probably the greater part of the Lamoure silt loam is used as pasture and hay land. It supports a good growth of native grasses and in places there is a vigorous growth of bluegrass in pastures. The areas in cultivation are for the most part confined to the positions least subject to damage from overflow. Corn is said to yield as much as 60 bushels per acre, with an average of 40 bushels. Wheat and oats are likely to lodge on this soil and are not grown to any extent.

SUMMARY.

McCook County is situated in the southeastern part of the State. It has an area of 573 square miles, or 366,720 acres. The topography is comparatively flat. The more broken part of the county is along Wolf Creek and the East Fork Vermilion River. The internal drainage of the soils is good, except for some small areas and one large area in the northwest part of the county. Small areas in which the surface drainage is poor, resulting in the formation of intermittent lakes, are scattered over the county. Dissection by streams has not reached a stage that provides drainage to all the farms.

The average elevation of the county is about 1,300 to 1,400 feet above sea level.

The first settlement was made in 1871. The present population is mostly of Scandinavian and Irish descent. The population in 1920 was 9,990, all classed as rural. Salem is the county seat. Other towns are Bridgewater, Spencer, Canistota, Montrose, and Unityville.

The county is served by three railroads. The principal markets are Sioux City, Sioux Falls, Minneapolis, and St. Paul.

The mean annual temperature is 45.1° F., and the mean annual rainfall 24.27 inches. The summers are warm and the winters cold.

The principal income of the farmers is derived from grains. Corn, oats, and wheat are the leading crops. Alfalfa and sweet clover are the chief tame-hay crops, and some surplus hay is sold. Considerable livestock is raised on the farm and fed for the market.

Crop rotation is not practiced as extensively as it should be; it is neglected largely because the soils are naturally productive. The farms are mostly well improved and equipped.

The proportion of farms operated by tenants is increasing rapidly the percentage in 1890 being 13.29 and in 1920, 51.8.

The soils of McCook County fall into three natural divisions, glacial lacustrine, and alluvial.

By far the greater part of the county is glacial, and the soils are of the Barnes and Beadle series. Most of the upland is occupied by soils of the Barnes series. The surface soils of the types in this series are dark-brown or black, with a brown subsurface layer and a highly calcareous yellow subsoil. Only one type of the Beadle series, the silt loam, is mapped. The soil differs from the Barnes in having a compact layer within the 3-foot section.

The lacustrine group is represented by the Fargo silty clay loam. The areas of this type occupy the lower lying spots in the upland where water accumulates. Their value varies with respect to the amount of water on them. Wild grass is cut from most of the areas that are too wet in the spring to cultivate. The surface soil is black, and the subsoil is black, brown, or drab in color, and heavier in texture.

The old-alluvial or terrace soils are included in the Sioux and Bearden series. The Sioux loam has a black surface soil and a yellow subsoil underlain by stratified sand and gravel. This soil is likely to be droughty in dry years. The Bearden soils have black surface soils, a brown subsurface, and a calcareous yellow subsoil. The loam and silt loam are mapped.

The recent-alluvial soils are all included in the Lamoure series. Two types, the silt loam and loam, are mapped. They occupy the present flood plains. The soils are dark colored, become heavier in the subsoil, vary from drab to black in color, and are highly calcareous.

The adaptation of soils to crops is recognized to a considerable extent. The Beadle soils are used more for small grains than for corn, and the lighter types of the other series are considered better soils for the production of corn.

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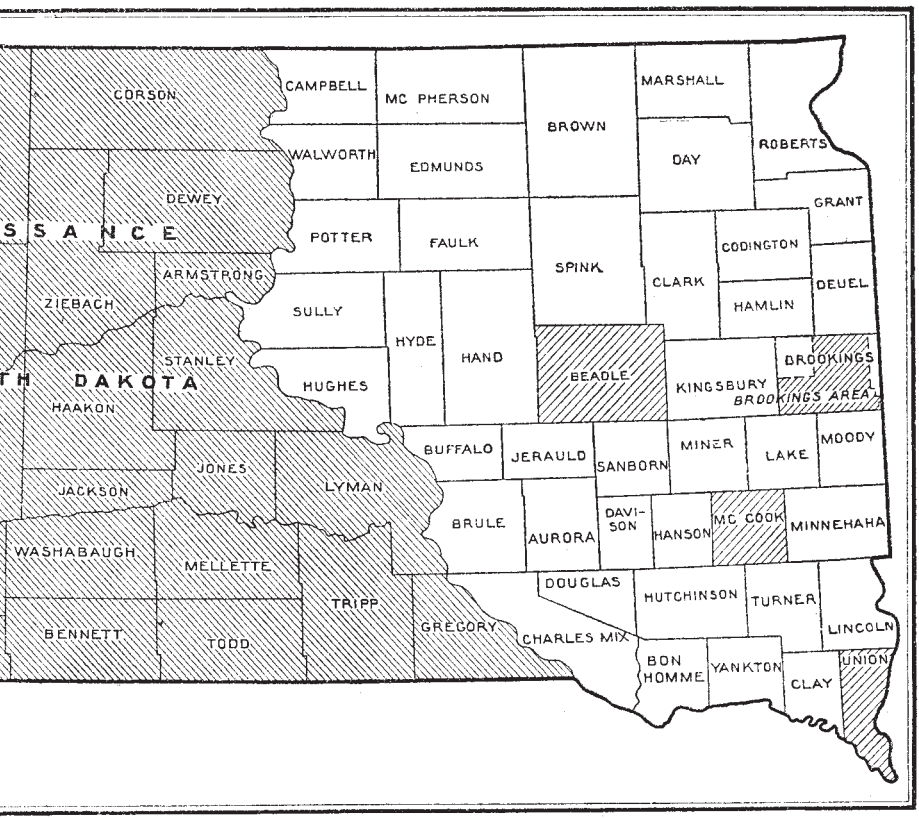

Areas surveyed in South Dakota, shown by shading.

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U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS
IN COOPERATION WITH THE
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

SOIL MAP

SOUTH DAKOTA
McCOOK COUNTY SHEET

LEGEND

- Barnes stony loam — Bl
- Bearden loam — Bo
- Barnes very fine sandy loam — Bv
- Bearden silt loam — Be
- Barnes loam — B
- Fargo silty clay loam — Fs
- Barnes silt loam — Bs
- Lamoure loam — L
- Flat phase
- Lamoure silt loam — Ls
- Beadle silt loam — Bm
- Sioux loam — S

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

- City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort.
- Secondary roads and Trails
- Railroads, Steam and Electric
- Bridges, Ferry
- R.R. crossings, Tunnel
- Ford, Dam
- School or Church, Cemeteries
- Mine or Quarry, Mine dumps, Made land
- Bluff, Escarpment, Rock outcrop and Triangulation station.
- Stony and Gravelly areas
- Soil boundaries
- Boundary lines
- Boundary lines
- Boundary lines
- U.S. township and section lines

RELIEF
(Printed in brown or black)

- Contours, Depression contours
- Prominent Hills, Mountain Peaks
- Sand, Wash, and Sand dunes
- Shore and Low-water line, Sandbar

DRAINAGE
(Printed in blue)

- Streams
- Lakes, Ponds, Intermittent lakes
- Intermittent streams
- Springs, Canals and Ditches, Flumes.
- Swamp, Salt marshes
- Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from this usage appear in some maps of earlier dates.

Soils surveyed by W. I. Watkins, in charge, and C. E. Deardorff, of the U. S. Department of Agriculture, and J. A. Machlis and Glen Avery, of the South Dakota Agricultural Experiment Station.

Scale 1 inch = 1 mile

A. Hoen & Co. Lith. Baltimore, Md.

Field Operations
Bureau of Soils
1921